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AUTHOR Coorough, Randall P.
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ABSTRACT

The purpose of this study was to examine the effects of three computer-assisted instruction (CAI) locus of instructional control strategies--learner control, learner control with advisement, and program control--on posttest performance and anxiety. The instructional content was a lesson addressing the effects of alcohol on the body. To examine the effects of the CAI lessons on learner anxiety and achievement, split-plot and pre- and posttest experimental designs were used. Subjects were undergraduate students randomly assigned to one of the three CAI treatment groups. All subjects completed the computer administered pre-assessment, CAI tutorial, and post-assessment. Pre- and post-assessment measurements consisted of a 24-item pretest and posttest along with a 10-item State-Trait Personality Inventory S-Anxiety subscale. Anxiety was assessed before, during, and after CAI. The major findings indicated that there were: (1) no significant achievement differences between lesson control treatments; (2) significant decreases in subjects' state anxiety levels across measurement occasions that were the same across treatments; and (3) the learner control with advisement treatment required a significantly greater amount of time to complete the CAI lesson than was required by the learner control treatment. (4 tables, 31 references) (Author)

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The Effects of Program Control, Learner Control, and Learner Control with Advisement Lesson Control Strategies on Anxiety and Learning from Computer-assisted Instruction

Author:

Randall P. Coorough

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THE EFFECTS OF PROGRAM CONTROL, LEARNER CONTROL AND LEARNER CONTROL WITH ADVISEMENT LESSON CONTROL STRATEGIES ON ANXIETY AND LEARNING FROM COMPUTER-ASSISTED INSTRUCTION

Abstract

The purpose of this study was to examine the effects of three CAI locus of instructional control strategies (learner control, learner control with advisement and program control) on posttest performance and anxiety. The instructional content was a lesson addressing the effects of alcohol on the body. To examine the effects of the CAI lessons on learner anxiety and achievement, split-plot and pre- and posttest experimental designs were used. Subjects were undergraduate students randomly assigned to one of the three CAI treatment groups. All subjects completed the computer administered pre-assessment, CAI tutorial, and post-assessment. Pre- and post-assessment measurements consisted of a 24-item pretest and posttest along with a 10-item State-Trait Personality Inventory S-Anxiety subscale. Anxiety was assessed before, during, and after CAI. The major findings indicated that there were (1) no significant achievement differences between lesson control treatments; (2) significant decreases in subjects' state anxiety levels across measurement occasions that were the same across treatments; and (3) the learner control with advisement treatment required a significantly greater amount of time to complete the CAI lesson than was required by the learner control treatment.

Introduction

The microcomputer has evolved into an important tool for delivering instruction to students. An often cited advantage of computer-assisted instruction (CAI) is the control that can be given to individual learners over the lesson presentation (Hannafin,1984). Students using CAI may control the sequence, pace, depth of study, feedback, and presentation style of instruction thereby greatly accommodating individual learner requirements. Instructional control of CAI courseware has generally taken two forms: (a) externally controlled (learner control) instruction where learners have full or partial control over CAI lesson presentation (e.g. lesson sequence, pace or feedback); and (b) internally controlled (program control) instruction where CAI is preprogrammed by the designers leaving no control to learners (Hannafin, 1984).

Intuitively, many researchers have hypothesized that providing learners with greater control over instruction would result in greater individualization of instruction, higher achievement and more positive learner attitudes toward instruction. The research, however, in general, shows that learners exposed to learner control do not achieve more, effectively utilize control options, or manage their time more efficiently when compared to students using program

controlled CAI (Carrier, 1984; Clark, 1984; Merrill, 1980; Steinberg, 1977, Tennyson, 1980). A more recent review of the learner control research suggests that the empirical evidence provides only mixed support for the benefits of learner control (Milheim & Azbell, 1988).

Several researchers have suggested that achievement from learner controlled CAI is significantly enhanced when some form of advisement or "coaching" is provided to learners (Hannafin, 1984; Ross, 1984; Tennyson & Buttrey, 1980, Tennyson, 1981). This variation of learner controlled CAI, according to Hannafin (1984), provides learners with advisement based upon the learner's performance, while maintaining learner control over instructional variables in the lesson. Advisement may include recommendations for the number of practice items to complete, content to be reviewed, or sequence to follow. Milheim and Azbell (1988) in reviewing the learner control with advisement literature found that groups receiving advisement, in general (1) had higher posttest means; (2) had more students reach mastery; (3) had longer time on task; (4) needed less instructional time; and, (5) needed fewer instructional instances.

Given the microcomputer's ability to provide individualized instruction, it is important to understand the interaction between CAI design strategies and learners. Many learner attributes have been implicated as playing a positive or negative role in learning via CAI. Previous research has indicated that students' prior achievement (Ross & Rakow, 1980), locus of control (Louie, Luick, & Louie, 1985), motivation (Seymour, Sullivan, Story & Mosley, 1987), and sex (Fennema & Sherman, 1977) are all contributing factors to a student's performance with CAI. The research also indicates that anxiety, a very critical learner characteristic, can have profound implications for learning during CAI (Sieber, O'Neil & Tobias, 1977).

Tobias (1979) describes anxiety as an affective state that may cause interference in cognitive processing during any of the three information-processing components: input, processing, and output. Anxiety reactions to a particular situation, called state anxiety, are characterized by subjective feelings of apprehension and tension, accompanied by arousal of the nervous system (Spielberger, 1966). A number of studies investigating the interactions between learner anxiety and CAI have indicated that certain levels of anxiety can be debilitating toward performance in CAI (Leherissey, O'Neil, & Hansen, 1971; O'Neil, 1972; O'Neil, Spielberger, & Hansen, 1969).

While anxiety can affect learning in CAI, Clark (1984) has reported that efforts to alleviate anxiety which inhibits performance from computer-based instruction have largely failed. Clark further suggests that it may be more effective to circumvent debilitating anxiety rather than attempting to curing it. Therefore, elements in CAI designs that may reduce anxiety would have both positive affective and cognitive implications (Clark, 1984). Tobias (1979) recommends instructional designs that provide organized lesson structure, small instructional steps, continual feedback, examples, and sufficient instructional review time.

While the effects of anxiety on CAI performance have been documented empirically, the interaction of CAI lesson control strategies, anxiety and resulting learner performance remains less clear however. It has been suggested that the more control a student has over a learning task, the better will be the performance and as control over learning material increases anxiety levels would decrease (Sieber et al., 1977). A number of researchers have attempted to determine the effect of CAI on performance and anxiety when learners were given control of various instructional variables (e.g. memory support, presentation of visual stimuli, feedback, and sequence of instruction) (Collier, Poyner, O'Neil, & Judd, 1973; Gallagher, O'Neil & Dick, 1971; Hansen, 1972; Judd, Daubek, & O'Neil, 1975). These studies generally suggested that providing learners with control of the instructional variables did not necessarily facilitate performance over imposed control groups, however, learner control to some extent, seemed to reduce a student's anxiety level.

While learner control in the above studies did not facilitate increased performance, it did affect anxiety. The purpose of this investigation was to examine the effects of program controlled, learner controlled and learner controlled with advisement locus of instructional control strategies on learning and state anxiety levels. Specifically, this study sought to determine whether a learner controlled CAI lesson with advisement would differentially affect anxiety and performance when compared to other CAI lesson designs.

Methods

Subjects

The study subjects were 106 undergraduate students from elective humanities classes at the University of Florida. The subjects in these classes represented a general cross-section of the University of Florida undergraduate population. Participation in the study was voluntary and subjects were given extra credit for participation.

CAI Lesson Content

The computer-assisted instructional task selected for this study was an instructional program that introduced information and assisted students in developing an awareness of alcohol and its psychological and physiological effects on the body. The CAI program was divided into four sections: (a) Alcohol the Drug; (b) Effects of Alcohol; (c) Metabolism of Alcohol; and (e) Alcohol Withdrawal. Each lesson section consisted of from eight to ten instructional frames and embedded questions. The majority of instructional frames also consisted of multiple layers of textual information that were progressively presented as students proceeded. Each of the three CAI treatments consisted of the same basic CAI tutorial program content with modifications to the locus of instructional control as discussed below.

Instructional Treatments

Three CAI lesson versions representing different CAI locus of instructional control design strategies were developed for the Macintosh computer. The three lesson control strategies included program control, learner control, and learner control with advisement.

Program Controlled CAI. The program control version presented the lesson in a predetermined sequence. Students proceeded through the lesson answering embedded questions and receiving response sensitive feedback after each answer was given. Instruction continued with correct answers while incorrect responses resulted in branching to a review of the content related to the question. Learners were given a second opportunity to answer the question correctly and then the lesson continued.

Learner Controlled CAI. The learner controlled CAI version provided students with control over lesson sequence, content review, number of practice questions, and the decision when to terminate the CAI lesson. Learner control subjects could make control decisions at points where the program control treatment directed the learning task. Students controlled the lesson sequence by choosing the order of sections studied and were able to move forward or backward in each section as well. Students answered embedded questions or skipped them proceeding to the next instructional frame. Formative feedback was provided for correct answers. Students giving incorrect responses were given the option of branching to and reviewing content or to proceed to the next section. When students chose to review a segment, the option to repeat the question a second time was given. If the student chose not to repeat the question, the lesson continued to the next section. After the second presentation of the question, the lesson continued.

Learner Control with Advisement CAI. The learner control with advisement group was presented with the same CAI lesson version as the learner control group except that advisement was provided at each decision point in the lesson. At the decision points, students in the learner control with advisement condition were presented with advisement as to the recommended lesson sequence, when to review content, and when to repeat questions. If students attempted to proceed through the lesson in a sequence deemed inappropriate by the designer, advisement appeared suggesting the most appropriate lesson sequence. In addition, when learners answered questions incorrectly, advisement appeared suggesting that content be reviewed. If students attempted to leave the lesson before finishing all sections they were advised to complete all content areas before terminating instruction.

Procedures

State Anxiety Scale assessments, pretest measurements, CAI lessons, and posttest measurements were conducted in a lab where subjects were seated

individually at a Macintosh II workstation. Each Macintosh II was configured with a color monitor, keyboard, mouse and networked to a printer. There were a total of 16 Macintosh II workstations in the lab. Up to 16 subjects could be accommodated during a CAI session. While students were randomly assigned to treatment groups, they were allowed to sign up for any lab time scheduled, therefore, labs consisted of subjects from different treatment groups. Before starting the CAI lesson, subjects were given an introduction to the Macintosh Lab and then instructed how to use the mouse thereby enabling them to proceed through the HyperCard designed CAI lesson.

State Anxiety Scale Assessments. State anxiety was periodically assessed using the S-Anxiety subscale of the State-Trait Personality Inventory (STPI) developed by Spielberger (1979). The S-Anxiety subscale of the STPI, consisting of ten items, was administered three times via the Macintosh computer programmed with HyperCard. The session began with an initial assessment of state anxiety level (SA1) prior to beginning the CAI lesson and the pretest. Students responded to the ten questions by pointing with the mouse to the appropriate response (four possible responses) and then clicking the mouse button to select that response. Upon completing the initial state anxiety measurement, subjects were then branched to the pretest assessment. Subjects were later readministered the STPI state anxiety scale midway through the CAI lesson (SA2) and then again following administration of the posttest (SA3).

Pretest Procedures. Pretest measurements were conducted after the initial state anxiety assessment. The pretest consisted of 24 randomly ordered multiple-choice questions. The pretest was conducted via the Macintosh computer programmed by HyperCard. After the pretest, subjects were branched directly to the beginning of the CAI lesson.

Posttest Procedures. The posttest measurement, consisting of the same 24 pretest questions arranged in a different order, was conducted immediately following the CAI lesson prior to the administration of the final state anxiety inventory. The posttest was administered like the pretest.

Design and Data Analysis

In this study a split-plot experimental design with three between-treatment levels (program control, learner control, and learner control with advisement) and three within-treatment levels (pre-task, on-task and post-task state anxiety levels) was used to examine state anxiety measures. For achievement, a pretest-posttest experimental design was used. Subjects randomly assigned to the three treatment conditions were administered the same pretest and posttest measures along with periodic administrations (SA1, SA2, and SA3) of the S-Anxiety subscale of the STPI before, during and after instructional treatments. A multiple linear regression model was used to test

the relationship between posttest achievement and pretest performance, on-task state anxiety level (SA2), treatment, gender, and the two-way interactions of treatment by pretest and treatment by on-task anxiety.

Results

Anxiety-Treatment Interaction

Means and standard deviations for the group-treatment factor and within-subject factor are presented in Table 1. The split-plot analysis of variance of state anxiety change across measurement occasion for treatment conditions, shown in Table 2 demonstrates that there was no significant difference for the main effect of treatment, $F(2,103) = 0.40$, $p > .05$. In addition, there was no significant interaction between treatments (program control, learner control and learner control with advisement groups) and occasion (pretask, on-task and post-task) for state anxiety levels. The computed F ratio for the two-way interaction: Occasion by Treatment was $F(4,206) = 1.46$, $p > .05$.

There was a significant main effect for the within-subject variable of measurement occasion, $F(2,206) = 9.17$, $p < .05$. Specifically, this significant within-subject difference in state anxiety levels across measurement occasions reflects a general reduction of subjects' perceived level of state anxiety as the CAI lesson proceeded.

Insert Table 1 About Here

Insert Table 2 About Here

Independent Variables and Posttest Performance

A multiple linear regression model was used to test the relationship between posttest achievement and pretest performance, on-task state anxiety level (SA2), treatment, gender, and the two-way interactions of treatment by pretest and treatment by on-task anxiety. Results of the analysis are presented in Table 3. The regression analysis yielded a significant relationship, $F(1,96) = 6.93$, $p < .05$, between pretest scores and posttest scores following the CAI treatments. Pretest scores are a reliable predictor of posttest performance by study subjects.

The other independent variables of on-task anxiety, instructional treatment and gender revealed no significant relationship between the variable and posttest achievement. The computed F ratios for each of these independent variables are presented in Table 3.

It was also found that there was no significant relationship between the interaction of CAI instructional treatments and pretest scores on posttest achievement. In addition, there was no significant relationship between the interaction of CAI instructional treatments and on-task state anxiety levels on posttest achievement (Table 3).

Insert Table 3 About Here

Time

Means and standard deviations for the time required for each treatment to complete the CAI lessons are presented in Table 4. A one-way ANOVA yielded a significant main effect, $F(2,103) = 4.48$, $p < .05$, for treatment groups in the time required to complete the CAI learning task. Tukey's post hoc analysis indicated that a significant difference existed between the learner control with advisement treatment condition and the learner control condition with regard to time required to complete the CAI lesson. The learner control group used significantly less time to complete the CAI lesson than the learner control with advisement group.

Insert Table 4 About Here

Discussion

The results of this study indicate that providing learners with control or control with advisement over the instructional variables of lesson sequence, number of practice questions to answer, review of content related to questions answered incorrectly, and the decision when to terminate the CAI lesson had no significant impact on learner anxiety levels when compared to a program controlled CAI design. Three earlier CAI studies have previously reported that providing learners with control of instructional variables did result in decreases in state anxiety levels (Collier et al., 1973; Gallagher et al., 1971; Hansen, 1972). However, the reported decreases in state anxiety were not significantly lower than similar treatments where learner control was not provided. The present study similarly indicated that utilizing various locus of instructional control options does not produce differing levels of state anxiety that may in return impact learning. Therefore, locus of instructional control strategies may not be as important a factor in determining learner state anxiety levels as previously believed.

There was no interaction between CAI locus of instructional control strategy and occasion for measurement of state anxiety levels. The state anxiety measurements of study subjects indicated a similar gradual reduction of state anxiety for all treatment groups across the CAI lesson. A number of researchers have theorized and tested the hypothesis that providing learners with control over certain instructional variables would enhance learning and reduce anxiety levels (Collier et al., 1973; Gallagher et al., 1971; Hansen, 1972; Judd et al., 1975). This study supported the results of Hansen (1972) and Judd et al. (1975) in finding that learner control (or the learner control with advisement) had no different effect on state anxiety levels in instructional situations than caused by an imposed control (program control) condition. The program control condition did not create higher anxiety levels that may have indicated that learners felt constrained or overly directed by the imposed control.

Several possible explanations may have accounted for the significant decreases in state anxiety levels across measurement occasions for the treatment groups. First, all learners, when exposed to a new, unfamiliar and potentially threatening learning experience can be expected to initially exhibit high state anxiety levels in response to the situation. In this study learners may have become familiar and more comfortable with the learning situation and overcame their initial state anxiety reaction.

A second reason may have been that many individuals perceive any sort of technology as potentially threatening. The emergence of computers in education has led to concerns, both cognitively and emotionally based, about the response of learners to the new technology (Cambre & Cook, 1985). Computer anxiety has been conceptually defined as "the mixture of fear, apprehension, and hope that people feel when planning to interact or when actually interacting with a computer (Rohner & Simonson, 1981, p. 551)." Since a majority of subjects in this study (61%) indicated that they had little or no computer experience, it could be expected that they would react initially with high levels of state anxiety. In general, the CAI treatments resulted in no negative effects on learner anxiety levels or attitude. Upon completing the CAI lesson, students were asked to rate their attitude (negative, neutral, or positive) toward the CAI lesson. Results of the attitude survey indicated that 86% of all study subjects responded positively to the CAI learning experience, 14% indicated that their feelings were neutral, while no one responded negatively toward the CAI lesson.

The results of the multiple linear regression analysis indicated that there was a significant relationship between study subject's pretest scores and their posttest scores following the CAI treatment. For the CAI lesson, a learners' pretest score appears to be a reliable predictor of their performance on the posttest measurement. By establishing this relationship between prior knowledge and posttest achievement, CAI designers can use pretest scores to identify those learners requiring extra instructional support.

The regression analysis indicated that there was no significant

relationship between subjects' on-task (SA2) state anxiety levels and their posttest performance. In the present study, subjects who were high in state anxiety and subjects who were low in state anxiety did not differ with regard to posttest achievement resulting from the CAI treatments. Tobias (1979) has suggested that high anxiety can be debilitating in instructional situations. However, this study indicated that state anxiety levels did not affect learning performance.

The CAI lesson designs may have been a more important factor in assuring that anxiety or lack of anxiety had a minimal impact on learning. In the design of the CAI courseware, recommendations were followed from Tobias' (1979) model which provides instructional researchers with guidelines for designing instruction to minimize anxiety in instructional situations. The provision for immediate practice of instructional content, remediation, well organized content, and providing students with the ability to reexamine instructional input (available only for learner control and learner control with advisement groups) may have minimized any influence that anxiety may have had during the learning task.

The data analysis indicated that there was no significant relationship between CAI treatment group and posttest achievement. The mean posttest scores were 18.94 for the program control, 17.97 for the learner control and 18.66 for the learner control with advisement treatment group. While there was no significant posttest achievement difference between the three locus of instructional control strategy treatments, subjects of the three treatment groups did answer an average of 77% of the posttest questions correctly.

A number of researchers who have reviewed the learner controlled research have indicated that learner control strategies do not result in any drop in learning, yet there was no clear indication that the overall use of learner control caused any increase in student achievement, efficiency, or attitude toward instruction (Merrill, 1980; Milheim & Azbell, 1988; Steinberg, 1977). This research study is supportive of these conclusions that learner control possesses no advantage over imposed control instruction.

Clark (1984) and Carrier (1984) suggested that learners may not be sophisticated enough to effectively direct their own learning strategies when provided control over instructional variables. Hannafin (1984) suggested that providing learner advisement during the instructional task would assist students in utilizing the learner control features more effectively. The results of this research study however, do not support the recommendations made by Hannafin (1984). In the present study, the advisement provided to learners in the learner control with advisement group did not result in any greater achievement on the posttest when compared to posttest achievement of the learner control group which did not receive advisement. The addition of the advisement to the learner control strategy actually increased the instructional time utilized by the learner control with advisement group, yet there was no associated learning gain.

Several important implications for educational researchers and CAI

courseware designers are provided by this study. The three locus of instructional control strategies implemented in this research study did not have any differential effect on learning. Therefore, the issue of whether to incorporate differing locus of instructional control options in CAI courseware desig s may not be as critical as previously believed. This stud does suggest that well planned systematically designed courseware can be effective when certain guidelines are followed. In this study, all three CAI treatments consisted of well organized instruction, individual student pacing of the lesson, embedded practice questions, immediate feedback, and opportunities for remediation. Computer-assisted instruction designers should be aware that using a systematic approach utilizing a model such as the one presented by Roblyer (1988) may be more important than locus of instructional control considerations in the design of CAI.

In this study it was determined that there was no significant relationship between a subjects gender and their posttest performance. Although the computer experience level for males and females were quite different, it did not affect learning performance. The computer experience level of males was considerably higher than for females. Before the computer lesson, students were asked to indicate their self-perceived computer experience level (a. little or no computer experience; b. moderate computer experience; or c. extensive computer experience). About 46% of males compared to 70% of females indicated that they possessed little or no computer experience. About 51% of males reported having moderate computer experience while only 28% of females reported the same experience level. Only 3% of males indicated they had extensive computer experience compared to less than 2% for females. With this large disparity between computer experience levels of males and females, one might expect some effect on learning. However, no effect was evident. Any gender or differences in computer experience levels of the subjects was apparently counteracted by the CAI lesson design.

An interaction between pretest scores and CAI treatments on posttest performance was not found. This is in contrast to a study by Gay (1986) who investigated learner control and a student's prior conceptual understanding in a computer-assisted interactive video lesson. Gay found that low aptitude subjects in the learner control group had significantly lower posttest scores than the low aptitude subjects in a program control group and lower posttest scores than high aptitude subjects in either group. The lack of an interaction in the present study suggests that learners of all entering ability levels were able to effectively use the control options provided.

There was no significant relationship between the interaction of treatment and on-task state anxiety levels on posttest achievement. No treatment condition served to provide learners, with varying levels of anxiety, with a more efficacious lesson design strategy for affecting posttest achievement. State anxiety levels may therefore not be an important consideration when designing CAI courseware that will utilize various locus of instructional control methodologies.

The time required to complete the CAI lesson was significantly less for the learner control group than required by the learner control with advisement group. This was the only significant difference among the three groups with regard to time. While the learner control with advisement group utilized 4.62 minutes more than the learner control group, there was no associated posttest achievement gain. This finding is similar to the study by Goetzfried and Hannafin (1985) who also found no achievement gains resulting from increased learning time required by learner control with advisement group. In this study students in the learner control condition seemed to be a good judge of when to answer embedded questions and when to review the content related to the questions in the case of a wrong answer. Students in the learner control condition answered an average of 20.9 questions while the learner control with advisement group answered an average of 30.9 questions (students in the program control condition answered all 29 embedded questions). This is a very critical issue when dealing with valuable instructional time and in designing CAI courseware.

The CAI designer must be aware that the various locus of instructional control strategies require different amounts of instructional time for students to complete the lesson. In this study, the learner control with advisement treatment required significantly more time to complete the lesson than did the learner control condition yet showed no significant achievement gain. Students in the learner control with advisement group not only spent more time on task but also attempted more embedded questions as well. The learner control with advisement lesson apparently created greater diligence to the learning task. Additional research would be useful in determining the most effective use of advisement and in what situations advisement should be provided. Finally, it would also be valuable to examine if the extra time on task required by the learner control with advisement group impacted long-term retention of the CAI content when compared to the other lesson design strategies. The extra time used by this group may ultimately impact long-term retention and be worth the additional short-term effort.

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TABLE 1.

Means and Standard Deviations for State Anxiety Measurement Occasions by Treatment Condition

Control Strategy		SA1	SA2	SA3
Program Control (N=37)	Mean	18.05	16.38	15.84
	SD	(5.00)	(4.90)	(5.32)
Learner Control (N=37)	Mean	16.67	15.65	15.35
	SD	(5.20)	(5.73)	(5.27)
Learner Control Advisement (N=32)	Mean	16.12	16.41	15.19
	SD	(4.58)	(4.98)	(5.10)

Notes: SA1 = State Anxiety Measurement 1 (pre-task); SA2 = State Anxiety Measurement 2 (on-task); SA3 = State Anxiety Measurement 3 (post-task).

TABLE 2.

Source Table of ANOVA of State Anxiety Change Across Measurement Occasions for Treatment Conditions

Source	SS	df	MS	F
Between Treatments				
Treatments	53.23	2	26.62	0.40
Error	6847.29	103	66.48	
Within Treatments				
Occasion	117.80	2	58.90	9.17*
Occasion X Treatment	37.64	4	9.41	1.46
Error (occasion)	1323.40	206	6.42	

*p< .05 with Geisser-Greenhouse correction

TABLE 3.

Linear Regression to Test the Relationship Between Independent Variables and Posttest Performance

Source	Type III SS	df	MS	F
Pretest	76.55	1		6.93*
SA2	15.17	1		1.37
Treatment	5.22	2		0.24
Gender	1.43	1		0.13
Pretest X Treatment	1.99	2		0.09
SA2 X Treatment	37.22	2		1.69
Error	1060.31	96	11.04	

*p< .01 Note: The overall test of significance was F = 1.85 with df = 9,96.

TABLE 4.

Means and Standard Deviations for Time to Lesson Completion by Treatment Condition

Control Strategy		Time (in minutes)
Program Control (N=37)	Mean	26.88
	SD	(6.48)
Learner Control (N=37)	Mean	23.75
	SD	(6.97)
Learner Control Advisement (N=32)	Mean	28.37
	SD	(6.26)